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**Datasheet for the decision
of 7 April 2022**

Case Number: T 3204/19 - 3.2.08

Application Number: 14804300.3

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Title of invention:
ELECTRIC LINEAR ACTUATOR

Applicant:
NTN Corporation

Headword:

Relevant legal provisions:
EPC Art. 123(2), 84, 54
RPBA 2020 Art. 11

Keyword:

Main request and auxiliary requests 1 to 4 - added subject-matter (yes)

Auxiliary request 5 - claim 1 - added subject-matter (no), clarity (yes), novelty (yes)

Remittal - special reasons for remittal - (yes)

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Catchword:



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Case Number: T 3204/19 - 3.2.08

D E C I S I O N
of Technical Board of Appeal 3.2.08
of 7 April 2022

Appellant: NTN Corporation
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 19 July 2019
refusing European patent application No.
14804300.3 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairwoman P. Acton
Members: M. Olapinski
C. Schmidt

Summary of Facts and Submissions

- I. The appeal was filed by the applicant against the examining division's decision to refuse the application.
- II. The examining division found that the subject-matter of claim 1 was not novel over US 2005/121251 A1 (D1).
- III. Oral proceedings before the Board were held by videoconference on 7 April 2022.
- IV. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request filed on 19 May 2019, on the basis of one of auxiliary requests 1 to 4 filed with the letter dated 27 September 2021, or on the basis of auxiliary request 5 filed during the oral proceedings before the Board.
- V. Claim 1 of the main request reads (with feature denominations introduced by the Board; amendments compared to claim 1 as originally filed are highlighted):

"a) An electric linear actuator (1) comprising:

b) a housing (2);

c) an electric motor (M) including a shaft (M/S) mounted on the housing (2); and

d) a speed reduction mechanism (5) coupled with the electric motor shaft (M/S) for reducing the rotational speed of the electric motor (M) and transmitting the

rotational power of the electric motor (M) to a ball screw mechanism (7) for converting the rotational motion of the electric motor (M) to the axial linear motion of a driving shaft (6);

e) the ball screw mechanism (7) comprising:
a nut (18) formed with a helical screw groove (18a) on its inner circumference and supported by rolling bearings (20 and 20) mounted on the housing (2) rotationally but axially immovably; and

f) a screw shaft (10) coaxially integrated with the driving shaft (6), formed with helical screw groove (10a) on its outer circumference corresponding to the helical screw groove (18a) of the nut (18), inserted into the nut (18) via ~~a large number of~~ numerous balls (17), and supported axially movably but not rotationally relative to the housing (2) ~~characterized in,~~

g) ~~that~~ wherein the housing (2) comprises a first housing (2a) on which the electric motor (M) is mounted and a second housing (2b) to be abutted against an end face of the first housing (2a),

h) ~~that~~ wherein the first housing (2a) is formed with an extending cylindrical gear containing portion (24) encircling the electric motor shaft (M/S) and a speed reduction mechanism (5) for containing the speed reduction mechanism (5),

i) that part of an end of the gear containing portion (24) of the first housing (2a) extends radially inward to form a bottom portion (25) positioned beyond the electric motor shaft (M/S) for covering at least a

portion of an input gear (3) of the speed reduction mechanism (5), and

j) ~~that~~wherein the bottom portion (25) of the first housing (2a) and the second housing (2b) are formed with abutment surfaces (21 and 22) respectively,

characterized in that

k) each of the abutment surfaces (21 and 22) respectively of the first and second housings (2a and 2b) is formed to have a substantially circular configuration, and

l) in that the housing (2) is a two-piece housing (2) formed by the first and second housings (2a and 2b)."

- VI. Claim 1 of auxiliary request 1 differs from claim 1 of the main request by the deletion of "coupled with the electric motor shaft (M/S)" in Feature d) and by the deletion of "extending" in Feature h).
- VII. Claim 1 of auxiliary request 2 differs from claim 1 of auxiliary request 1 by the deletion of "positioned beyond the electric motor shaft (M/S)" in Feature i).
- VIII. Claim 1 of auxiliary request 3 differs from claim 1 of auxiliary request 2 by the insertion of "for abutting against each other" at the end of Feature j).
- IX. Claim 1 of auxiliary request 4 differs from claim 1 of auxiliary request 3 by the deletion of "substantially" in Feature k).
- X. Claim 1 of auxiliary request 5 reads as follows (with feature denominations introduced by the Board;

amendments compared to claim 1 according to the main request are highlighted):

"a) An electric linear actuator (1) comprising:

b) a housing (2);

c') an electric motor (M) ~~including a shaft (M/S)~~ mounted on the housing (2), the electric motor (M) including a shaft (M/S); and

d') a speed reduction mechanism (5) ~~coupled with the electric motor shaft (M/S)~~ for reducing the rotational speed of the electric motor (M) and transmitting the rotational power of the electric motor (M) to a ball screw mechanism (7) for converting the rotational motion of the electric motor (M) to the axial linear motion of a driving shaft (6);

e) the ball screw mechanism (7) comprising:
a nut (18) formed with a helical screw groove (18a) on its inner circumference and supported by rolling bearings (20 and 20) mounted on the housing (2) rotationally but axially immovably; and

f) a screw shaft (10) coaxially integrated with the driving shaft (6), formed with helical screw groove (10a) on its outer circumference corresponding to the helical screw groove (18a) of the nut (18), inserted into the nut (18) via numerous balls (17), and supported axially movably but not rotationally relative to the housing (2),

g) wherein the housing (2) comprises a first housing (2a) on which the electric motor (M) is mounted and a

second housing (2b) to be abutted against an end face of the first housing (2a),

h') wherein the first housing (2a) is formed with a ~~an extending cylindrical gear containing portion (24) encircling the electric motor shaft (M/S) and the speed reduction mechanism (5)~~ for containing the speed reduction mechanism (5), the cylindrical gear containing portion (24) encircling the electric motor shaft (M/S) and the speed reduction mechanism (5),

i') ~~that~~wherein part of an end of the gear containing portion (24) of the first housing (2a) extends radially inward to form a bottom portion (25) ~~positioned beyond the electric motor shaft (M/S) for covering at least a portion of an input gear (3) of the speed reduction mechanism (5),~~ and

j') wherein the bottom portion (25) of the first housing (2a) and the second housing (2b) are formed with abutment surfaces (21 and 22) respectively for abutting against each other,

characterized in that

k') each of the abutment surfaces (21 and 22) respectively of the first and second housings (2a and 2b) is formed to have a ~~substantially~~-circular configuration, and

l) in that the housing (2) is a two-piece housing (2) formed by the first and second housings (2a and 2b)."

XI. The appellant's arguments can be summarised as follows:

Main request - Article 123(2) EPC

Amended Feature i) in claim 1 derived from Figure 1 of the application as filed. Read together with Features j) and k), it defined the bottom portion's shape, size and position as shown in Figure 1. Hence, the subject-matter of claim 1 did not extend beyond the content of the application as filed.

Auxiliary requests 1 to 4 - Article 123(2) EPC

Auxiliary requests 1 to 4 addressed the issues raised in the Board's communication, thus overcoming the objection under Article 123(2) EPC against Feature i).

Auxiliary request 5 - Novelty, D1

The subject-matter of claim 1 was novel over D1. In particular, D1 did not disclose a "two-piece housing" as required in Feature l). As a consequence, D1 did not disclose Features h') to k'), either, nor, in particular, the circular configuration of the abutment surfaces.

Reasons for the Decision

1. **Main request** - Article 123(2) EPC

- 1.1 Feature i) of claim 1 defines that "part of an end of the gear containing portion (24) of the first housing (2a) extends radially inward to form a bottom portion (25) positioned beyond the electric motor shaft (M/S) for covering at least a portion of an input gear (3) of the speed reduction mechanism (5)" (amendments compared to claim 1 as originally filed are highlighted).

1.2 According to the applicant, these amendments were based on Figure 1. Read together with Features j) and k), Feature i) defined that the bottom portion formed the radial transition from the cylindrical gear containing portion to the first housing's circular abutment surface and partly covered an input gear of the speed reduction mechanism, as shown in Figure 1. Accordingly, claim 1 defined the bottom portion's position, shape and size in line with Figure 1.

1.3 However, claim 1 does not specify that the bottom portion covers the input gear to the same extent as shown in Figure 1.

In the longitudinal cross-sectional view of Figure 1, the bottom portion extends radially inward almost as far as the lowest point of the input gear. Hence, the bottom portion covers most but not all of the input gear (as seen from the point of view of the second housing along the axial direction).

By contrast, Feature i) only requires that the bottom portion covers "at least a portion" of an input gear of the speed reduction mechanism. This includes bottom portions which cover the input gear to an extent ranging from a small fraction to the entirety of the input gear and beyond. Hence, Feature i) encompasses geometries which are not disclosed in Figure 1.

Accordingly, at least the subject-matter of Feature i) of claim 1 extends beyond the content of the application as filed. The main request is thus not allowable under Article 123(2) EPC.

2. **Auxiliary requests 1 to 4** - Article 123(2) EPC

Feature i) of claim 1 of each of auxiliary requests 1 to 4 still defines that the bottom portion covers "at least a portion of an input gear", which is not directly and unambiguously disclosed in Figure 1.

The deletion of "positioned beyond the electric motor shaft (M/S)" from Feature i) in auxiliary requests 2 to 4 and the other amendments in auxiliary requests 1 to 4 which are not related to Feature i) do not overcome the objection raised with respect to Feature i).

Hence, auxiliary requests 1 to 4 are not allowable under Article 123(2) EPC either.

3. **Auxiliary request 5**

3.1 Claim 1 - Article 123(2) and 84 EPC

3.1.1 Feature i') of claim 1 of auxiliary request 5 is identical to the corresponding feature of claim 1 as originally filed. Hence, the objection under Article 123(2) EPC that was raised against Feature i) of the preceding requests is overcome. In addition, the objections raised under point 2.4 in the Board's communication under Article 15(1) RPBA 2020 are rendered moot.

3.1.2 The objection raised in the Board's communication under point 2.1 is overcome by the deletion of "substantially" in Feature k). This amendment is justified in view of Figure 3(a), which discloses a circular abutment surface (22) without the deviations from the circular configuration encompassed by "substantially" according to paragraph [0037].

3.1.3 The objections under points 2.2 and 2.3 of the Board's communication are overcome by reversing the amendments objected to in Features d) and h).

3.1.4 Claim 1 of auxiliary request 5 specifies that the abutment surfaces are "for abutting against each other". This amendment is derived from the overall context of the application and especially from Figure 3(b). Hence, the objection under point 2.5 of the Board's communication is overcome.

3.1.5 It is thus concluded that independent claim 1 of auxiliary request 5 fulfils the requirements of Articles 84 and 123(2) EPC.

3.2 Novelty, D1

3.2.1 It is undisputed that the embodiment of Figure 5 in D1 discloses an electric linear actuator as defined in Features a) to g) of claim 1.

The appellant submitted that the subject-matter of claim 1 of auxiliary request 5 differed from D1 by a "two-piece housing" according to Feature l) and, as a consequence, also by Features h') to k'), in particular by a "circular configuration" of the abutment surfaces.

3.2.2 "two-piece housing" (Feature l))

Feature g) of claim 1 defines that the housing of the actuator "comprises" a first housing and a second housing. Feature l) further specifies "that the housing is a two-piece housing formed by the first and second housings".

The term "two-piece" specifies the structure of the housing in terms of the number of its pieces and spells out an exact number (two). It must thus be understood to require exactly two "pieces". This is also in line with the expression "formed by" in Feature 1). Therefore, Feature 1) implies that the first and second housings are "one-piece" units.

It is true that the housing of Figure 1 of the patent is "open on the left side". However, this does not imply further housing pieces or contradict the term "two-piece" used in Feature 1). As submitted by the appellant, openings are necessary for interfacing with external devices. Housing parts of any such external devices are not understood as additional pieces of the housing of the actuator. Likewise, the housing of the electric motor is not considered to represent a further "piece" of the "housing" of the actuator of Feature b), either, because Feature c') defines that the electric motor is a separate unit "mounted on the housing". Accordingly, the presence of openings, a motor or external devices does not justify a different interpretation of Feature 1).

Figure 5 of D1 shows a housing with three pieces, namely a "rack shaft housing 50", a "gear housing 54" and a "rack shaft housing 55" (paragraph [0144]), and thus does not disclose Feature 1).

Regarding the embodiment of Figure 1 in D1, a "two division structure" of the housing into a "left housing 18" and a "right housing 17" is mentioned (paragraph [0131]). However, Figure 1 also shows a third housing on the right-hand side, which corresponds to the rack shaft housing 55 of Figure 5. Hence, the embodiment

according to Figure 1 does not disclose Feature l) either.

Accordingly, D1 does not disclose Feature l).

3.2.3 Feature k')

As argued by the appellant, given the interpretation of the term "two-piece" in Feature l), the "rack shaft housing 50" alone corresponds to the "first housing" of claim 1 because it mounts the electric motor (flange 46; Feature g)). The "gear housing 54" equates to the "second housing" of claim 1 because it abuts against an end face of the first housing.

Since Figure 6 of D1 shows that the abutment surfaces between the "rack shaft housing 50" and the "gear housing 54" do not have a "circular configuration", D1 does not disclose Feature k') either.

3.2.4 Features h') to j')

The "rack shaft housing 50", which corresponds to the first housing of claim 1, does not exhibit "a" (common, continuous) gear containing portion suitable "for containing the speed reduction mechanism", as required by Feature h'). Such a "gear containing portion" is only formed in the "gear housing 54", which represents the second housing of claim 1. Hence, D1 does not disclose Feature h'). It follows that D1 does not disclose a bottom portion formed with an abutment surface according to Features i') and j') either.

3.2.5 Accordingly, the subject-matter of claim 1 of auxiliary request 5 differs from the actuator of D1 by Features

h') to l). The subject-matter of claim 1 of auxiliary request 5 is thus novel with respect to D1.

4. **Remittal**

In the present case, the examining division decided only on the question of novelty of the subject-matter of claim 1 with respect to document D1.

In its analysis of the subject-matter of claim 1, the Board found further objections under Articles 84 and 123(2) EPC, which needed to be addressed before the Board was able to decide upon the appeal. These additional objections led to a revision of the subject-matter of claim 1, *inter alia* by reversing some of the amendments made during the examination proceedings.

Under these circumstances, the Board considers it an undue burden to render a final decision on the remaining issues, in particular novelty in view of the pertinent state of the art, inventive step, and whether or not the dependent claims fulfil the requirements of Articles 84 and 123(2) EPC.

Thus, a special reason within the meaning of Article 11 RPBA 2020 exists for remitting the case.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the examining division for further prosecution on the basis of auxiliary request 5, filed during the oral proceedings before the Board.

The Registrar:

The Chairwoman:



C. Moser

P. Acton

Decision electronically authenticated